

Statement Execution Statistics

The Statement Execution Statistics function is used to obtain statistical information on which statement lines of invoked programming objects were executed. The function also provides information on how often an object was invoked and how often a statement line was executed.

Statement execution statistics can be used for

- detecting dead (never gets executed) programming code in an application.
- estimating the coverage of an application test (how many statement lines have not been executed at least once for testing).
- locating frequently executed code segments that could have an impact on the application's performance.

This section covers the following topics:

- Set Statement Execution Statistics ON/OFF/COUNT
 - Invoke Statement Execution Statistics
 - Delete Statement Execution Statistics
 - Display Statement Execution Statistics
 - Print Statements
-

Set Statement Execution Statistics ON/OFF/COUNT

With this function, you activate statistics about executed statement lines of programming objects.

Below is information on:

- Setup Options
- Activate/deactivate Statistics

Setup Options

When starting a program with Statement Execution Statistics ON or COUNT, all statement lines executed within a specific object are listed in a statistical report.

With the option ON, the Debugging utility only retains whether a specific statement line was executed or not; with the COUNT option, it counts how often a statement line was executed. You can specify a library and an object name to restrict statement execution statistics to the desired programming objects. The default is to collect statistics for all objects of the current library. Asterisk (*) notation is possible.

If you switch Statement Execution Statistics from ON to COUNT or vice versa, existing statistics are not affected, that is, their status of ON or COUNT remains.

The statistical data collected is stored in the debug buffer. The amount of storage that is required to store statistical information for a programming object is approximately

(number of source lines) / 8 + 100 bytes with Statement Execution Statistics ON and
(number of source lines) * 4 + 100 bytes with Statement Execution Statistics COUNT.

If you modify a programming object by inserting or deleting lines and you do not renumber the object lines before you STOW it, the amount of storage required for the object's statistics may increase. To avoid this, set Auto Renumber to Y (Yes) in the editor profile or use the command CATALL with the function Renumber source code lines option enabled (this is the default).

You can use the direct command PROFILE to limit the size of the debug buffer. With Statement Execution Statistics

set to option COUNT, no statement execution statistics are collected for objects with more than 8000 statement lines.

Statement Execution Statistics are part of the debug environment; therefore, they are affected by the direct commands SAVE ENVIRONMENT and LOAD ENVIRONMENT (see also the section Debug Environment Maintenance).

Activate/deactivate Statistics

Below are instructions on how to activate or deactivate the function Statement Execution Statistics Maintenance. You can specify a library and/or an object name to restrict statement execution statistics to the desired programming objects. The default is to collect statistics for all objects of the current library. Asterisk (*) notation is possible.

To activate Statement Execution Statistics

- On the Statement Execution Statistics Maintenance screen, enter Function Code **S**, the name of a library and/or the name of an object. In the State field, change the value to ON.
Or enter the direct command SET XSTATISTICS ON or COUNT *library (object)*
(see also the syntax of SET in Command Summary and Syntax).

If you do not specify a library and/or an object, the statistics data about all objects in your current library are activated.

To deactivate Statement Statement Execution Statistics

- On the Statement Execution Statistics Maintenance screen, enter Function Code **S**, the name of a library and/or the name of an object. In the State field, change the value to OFF.
Or enter the direct command SET XSTATISTICS OFF *library (object)*
(see also the syntax of SET in Command Summary and Syntax).

If you do not specify a libber and/or an object, the statistics data about all objects in your current library are deactivated.

Invoke Statement Execution Statistics

To invoke the Statement Execution Statistics Maintenance function

- On the Debug Main Menu, Function Code **X**.
Or enter the direct command XS.
The Statement Execution Statistics Maintenance screen is displayed which provides the following functions:
 - Set Test Mode ON/OFF
(see the relevant section)
 - Set Statement Execution Statistics ON/OFF/COUNT
 - Delete Statement Execution Statistics
 - Display Statement Execution Statistics
 - Print Statement Execution Statistics
 - Print All Statements
 - Print Executed Statement
 - Print Non-Executed Statements

The print functions are described under Print Statements below.

Delete Statement Execution Statistics

▶ To delete Statement Execution Statistics

- On the Statement Execution Statistics Maintenance menu, enter Function Code **C** and the name of a library and/or the name of an object.
Or enter the direct command `DELETE XSTATISTICS library (object)`
(see also the syntax of `DELETE` in Command Summary and Syntax).

If you do not specify a library and/or an object, the statistics data about all objects in your current library are deleted.

Display Statement Execution Statistics

The List Statement Execution Statistics screen displays a list of the specified statement execution statistics.

▶ To invoke the List Statement Execution Statistics screen

- On the Statement Execution Statistics Maintenance menu, enter Function Code **D**.
Or enter direct command `DISPLAY XSTATISTICS`.
The List Statement Execution Statistics screen is displayed:

16:02:01		***** NATURAL TEST UTILITIES *****								2002-02-15	
Test Mode ON		- List Statement Execution Statistics -								Object	
Co	Object	Library	Type	DBID	FNR	Obj.Called	Exec	Exec	%	Total	All
	*	*				n Times	able	uted		Executions	
___	PGM01	SAG	Program	10	32	4	20	17	85		95
___	MAP01	SAG	Map	10	32	6	2	2	100		12
___	SPGM02	SAG	Subprogram	10	32	2	6	2	33		4
___	SAGTEST1	SAG	Program	10	32	2	20	10	50		17
___	DEBPGM	SAG	Program	10	32	1	6	6	100		34

For each object, the following information is displayed:

- the call frequency;
- the number of executable statement lines (a statement line is executable if a breakpoint could be set on it; see the description of the command `SET BREAKPOINT` in the section Breakpoint Maintenance for more information);
- the number of executed statement lines;
- the percentage of executed statement lines as related to the total number of executable statement lines;
- the total number of executed statement lines.

A list entry is highlighted if data is missing or possibly inconsistent.

- On the statistics list, you can mark statement execution statistics with a line command for further processing:

Command	Explanation
DE	Deletes statement execution statistics as described above.
DS	Displays all statement lines.
DX	Displays executed statement lines only.
DN	Displays non-executed statement lines only.
I	Displays information on the cataloged object and errors.
PS	Prints all statement lines.
PX	Prints executed statement lines only.
PN	Prints non-executed statement lines only.

The print functions are also described under Print Statements below.

Below is information on:

- Display All Statement Lines
- Display Executed Statement Lines
- Display Non-Executed Statement Lines

Display All Statement Lines

The Display Statement Lines screen shows the object source and indicates whether or not a statement line has been executed.

To invoke the Display Statement Lines screen

- On the List Statement Execution Statistics screen, mark an entry with the line command **DS**.
Or enter the direct command **DISPLAY STATEMENT** *library (object)*
(see also the syntax of **DISPLAY** in Command Summary and Syntax).

The Display Statement Lines screen appears. If Statement Execution Statistics has been set to COUNT, the execution frequency of the statement line is displayed as shown in the example screen below:

16:04:01	*****NATURAL TEST UTILITIES *****	2002-02-15
Test Mode ON	- Display Statement Lines -	Object SAGTEST
Line Source		Count
0200 RD1. READ EMPLOYEES-VIEW BY NAME		2
0210 STARTING FROM #NAME-START THRU #NAME-END		
0220 *		
0230 IF LEAVE-DUE>= 20		1
0240 PERFORM MARK-SPECIAL-EMPLOYEES	not executed	
0250 ELSE	not executed	
0260 RESET #MARK		1
0270 END-IF		
0280 *		
0290 RESET #MAKE #MODEL		1
0300 CALLNAT 'SPGM02' PERSONNEL-ID #MAKE #MODEL		1
0310 *		
0320 WRITE TITLE / '*** PERSONS WITH 20 OR MORE DAYS LEAVE DU		1
0330 / '*** ARE MARKED WITH AN ASTERISK ***' //		
0340 DISPLAY '//N A M E' NAME		2

If no unique object has been specified, the List Statement Execution Statistics screen is displayed.

Display Executed Statement Lines

The Display Executed Statement Lines screen corresponds to the Display Statement Lines screen, but only the statement lines that have been executed are displayed.

To invoke the Display Executed Statement Lines screen

- On the List Statement Execution Statistics screen, mark an entry with the line command **DX**.
Or enter the direct command `DISPLAY EXEC library (object)`
(see also the syntax of `DISPLAY` in Command Summary and Syntax).

If no unique object has been specified, the List Statement Execution Statistics screen is displayed.

Display Non-Executed Statement Lines

The Non-Executed Statement Lines screen corresponds to the Display Statement Lines screen, but only the statement lines that have not been executed are displayed.

To invoke the Display Non-Executed Statement Lines screen

- On the List Statement Execution Statistics screen, mark an entry with the line command **DN**.
Or enter the direct command `DISPLAY NOEXEC library (object)`
(see also the syntax of `DISPLAY` in Command Summary and Syntax).

If no unique object has been specified, the List Statement Execution Statistics screen is displayed.

Print Statements

With the print functions, you can directly route a generated list of statement execution statistics to a printer.

If you do not specify a library name, the library where you are currently logged on is assumed by default.

As listed under Print Options below, to invoke one of the print functions, you can either enter a function code on the Statement Execution Statistics Maintenance menu, enter a line command on the Display Statement Lines screen, or enter a direct command:

Print Options

Print Function	Function Code	Line Command	Direct Command
Statement Execution Statistics	1		<code>PRINT XSTATISTICS <i>library (object)</i></code> .
All Statements	2	PS	<code>PRINT STATEMENT <i>library (object)</i></code> .
Print Executed Statements	3	PX	<code>PRINT EXEC <i>library (object)</i></code> .
Print Non-Executed Statements	4	PN	<code>PRINT NOEXEC <i>library (object)</i></code> .

See also the syntax of `PRINT` in Command Summary and Syntax.